

**NAMRL Technical Memorandum 99-01**

**AIRCREW MODIFIED EQUIPMENT  
LEADING TO INCREASED  
ACCOMMODATION (AMELIA) SUMMARY**

**A. H. Bransdorfer and K. R. Johnson**

**20000330 112**

**Naval Aerospace Medical Research Laboratory  
51 Hovey Road  
Pensacola, Florida 32508-1046**

**Approved for public release; distribution unlimited.**

**NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY  
51 HOVEY ROAD, PENSACOLA, FL 32508-1046**

**NAMRL Technical Memorandum 99-01**

**AIRCREW MODIFIED EQUIPMENT LEADING TO INCREASED  
ACCOMMODATION (AMELIA) SUMMARY**

**A. H. Bransdorfer and K. R. Johnson**

**Approved for public release; distribution unlimited.**

**DTIC QUALITY INSPECTED 3**

## **ABSTRACT**

Aviation life support systems (ALSS) equipment is a critical and essential component for mission success in naval aviation. Anecdotal comments by naval aircrews have indicated that ALSS equipment is perceived as ill-fitting and substandard. Additionally, many aircrews in naval aviation are not satisfied with current urine collection devices (UCDs). The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) survey was completed by 2,055 U.S. Navy and Marine Corps aircrew. The sample population included 85 women and 1,970 men. According to the survey results, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit. The overall performance of current ALSS was rated slightly above the median with the exception of the anti-exposure suit (rated below the median). Aircrews identified the flight suit as the number-one priority with respect to safety, thermal protection, and comfort. The helmet was identified as the number one priority item with respect to survivability. The majority of the sampled aircrew has required the use of urine collection devices (UCDs) during flight. These aircrews selected the piddle pack and relief tube as moderately acceptable solutions for urination during flight.

### **Acknowledgments**

We would like to acknowledge a number of individuals without whom this report could not have been completed. First, CDR T.L. Pokorski, LCDR B.E. Ortel, and LCDR D.G. Smith were the catalysts at the inception of the AMELIA study. A special thanks to J.G. Gandy and H.E. Cotton for formatting the tables in the appendix. Numerous individuals at all of the Aviation Survival Training Centers (ASTCs) spent hours administering and collecting the surveys. We would like to thank P.D. Collyer for his tireless contribution entering data and assisting in the statistical analyses. We are also thankful to all of the aviators who completed the questionnaire. Through their efforts, this report has become a reality.

## PROBLEM

Aviation life support systems (ALSS) equipment is a critical component for mission success in naval aviation. The continued development and improvement of ALSS is mission essential. According to anecdotal comments by naval aircrew, ALSS equipment has historically been perceived as ill fitting and substandard. Additionally, many aviators in naval aviation are not satisfied with current urine collection devices (UCDs).

## BACKGROUND

The Naval Air Systems Command (NAVAIRSYSCOM) funded an initial survey in 1993 to assess problems that female aircrew were encountering with current ALSS. The initial survey recorded responses for 67% of female aircrew in the Navy and Marine Corps. Following the initial survey, the study was expanded to include all naval aircrew, both male and female. The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) project was an effort sponsored by the Naval Air Warfare Center, Aircraft Division (NAWC-AD) and Program Manager Air-202 (PMA-202).

The purposes of this study were to evaluate ALSS fit characteristics, determine aircrew ALSS priorities, and identify problems associated with UCDs. The Naval Aerospace Medical Research Laboratory (NAMRL) designed the survey instrument, coordinated its administration, and analyzed the results. Completed surveys were received from 2,055 U.S. Navy and Marine Corps aircrew; this sample included 85 women and 1,970 men.

## DISCUSSION

Respondents were asked to answer questions concerning the fit and performance of selected ALSS equipment in the first section of the questionnaire. The fit of ALSS was scored from one to three, with one being a "poor" fit, two an "ok" fit, and three fitting "well." The overall performance of an item was rated on a scale from one to five, one being the lowest (poor performance) and five the highest (good performance).

The fit of ALSS appears to be an important fleet concern during ready room conversations with aircrew. According to the respondents of the AMELIA survey, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit (Table 1). The overall performance of current ALSS was slightly above the middle value of three. Again the anti-exposure suit was the exception with a performance rating of 2.8 (Table 1).

Table 1. Mean ALSS Fit Scores.

Equipment	Fit*	Performance**
Flight Suit	2.7	4.2
Flight Jacket	2.5	4.2
Flight Boots	2.5	4.2
Flight Gloves	2.6	4.3
Torso Harness	2.3	3.8
SV-2B	2.1	3.3
Anti-G Suit	2.5	4.1
O2 Mask	2.2	3.5
Helmet	2.3	3.7
Anti-Exposure Suit	1.9	2.8
Anti-Exposure Liner	2.2	3.4

\* 1 = poor, 2 = ok, 3 = well.

\*\* 1 = low, 5 = high.

Anecdotally, many aviators may be more likely to make comments within a ready room than may have been evidenced by the current questionnaire. To account for this limitation, aircrew members were encouraged to write in comments about the fit of each piece of ALSS they used. An appendix is provided for review in lieu of a lengthy

discussion within this summary. The anecdotal comments in the appendix are listed in order of frequency and are grouped by designator and aircraft platform.

The second section of the survey was designed so respondents could rank ALSS items according to 1) safety, 2) survivability, 3) thermal protection, and 4) comfort. The equipment in Table 2 was grouped based upon the total number of times the specific gear was selected by aircrew. The top items for all platforms in each category are listed in Table 2.

Table 2. ALSS Priorities.

Safety	Survivability	Thermal Protection	Comfort
Flight Suit (30.2)	Helmet (25.4)	Flight Suit (29.9)	Flight Suit (27.1)
Helmet (29.2)	SV-2B (23.6)	Anti-Exposure Suit (25.6)	Helmet (22.2)
SV-2B (13.7)	Flight Suit (19.0)	Flight Jacket (15.4)	Anti-Exposure Suit (19.2)
Anti-Exposure Suit (9.5)	Anti-Exposure Suit (11.7)	Boots (9.3)	SV-2B (11.7)

Note: The numbers in parentheses refer to the percentage of responses listing the item as the level-one priority.

The equipment listed in Table 2 highlights the primary ALSS priorities of naval aircrew. The priority items listed by aircrew provide continued support for the development and improvement of ALSS as demonstrated by the customer.

The third section of the survey was designed to identify problems and list solutions related to UCDs. Of the 2,055 respondents completing the section referring to UCD's, 81% had flown missions requiring the use of a UCD.

Aircrew members were asked to rate a number of UCD's on an acceptability scale. The relief tube and piddle pack were identified as moderately acceptable interim (3.7 and 3.2, respectively) and long-term solutions (3.8 and 3.2, respectively) for urination during flight. The tactical jet community ranked the piddle pack above the relief tube. Overall, however, the relief tube was preferred to the piddle pack as a solution for urination during flight.

Aircrew members were also asked how they dealt with urination during flight. A number of methods were listed. The most common method of accounting for urination during flight was "holding it." The piddle pack was the next preferred method of choice by aircrew. Table 3 lists the top five methods of dealing with the need to urinate during flight by all aircrew surveyed.

Table 3. Methods for Dealing With Urination During Flight.

Methods	Percentage
"Hold it"	20.4
Piddle Pack	17.7
Land Aircraft	13.8
Relief Tube	12.4
Pre-Flight "Head Call"	8.5

## CONCLUSION

Aviator-mounted systems are mission essential as well as critical for safety and survivability. The AMELIA Report provides a source of data to identify areas for improvement and continued development of ALSS.

## **APPENDIX**

### **ALSS SURVEY TALLY SHEETS:**

**Flight Suit**  
**Flight Jacket**  
**Flight Boots**  
**Flight Gloves**  
**Torso Harness**  
**Integrated Torso Harness**  
**SV-2**  
**Anti-G Suit**  
**Oxygen Mask**  
**Helmet**  
**Anti-Exposure Suit**  
**Anti-Exposure Liner**  
**Females**

Intentionally blank.



ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Suit																
	Comment	Total	Jet	Prop	Helo	Pilot	NFO	AC									
1	Breast pockets inaccessible during flight	621	158	193	270	420	72	129									
2	Bring back shroud cutter pocket	289	66	79	144	164	41	84									
3	Reinforce crotch stitching	262	69	120	73	175	37	212									
4	Zipper tabs break easily	251	81	67	103	160	28	63									
5	Uncomfortable under G-suit	162	58	40	64	85	18	59									
6	Heavier material in seat needed	136	26	60	50	86	15	45									
7	Poor supply (supply system)	126	26	41	59	85	14	27									
8	Need FOD flap	113	26	34	53	71	9	31									
9	Wrist needs more flexibility	53	20	17	16	17	13	23									
10	Need separate male/female	42	15	14	13	16	9	17									
11	Patches are burn hazard	41	12	11	18	23	5	10									
12	Desert suits fit poorly	30	10	10	10	18	2	10									
13	Poor pocket position (old suit)	20	5	8	7	10	4	6									
14	Need cushioned kneepads	19	10	7	2	8	4	7									
15	Zipper on lower leg falls across knee when kneeling	18	3	7	8	2	2	14									
16	Missing inner thigh pocket	18	2	5	11	9	2	7									
17	New suit pockets useless	16	7	6	3	6	5	5									
18	New suit poor quality	15	9	5	1	3	9	3									
19	New suit side zippers useless	12	3	0	9	8	0	4									
20	New suit cargo pockets too deep	12	3	4	5	6	0	6									
21	Prefer older style to new style	8	3	3	2	5	0	3									
22	New suit missing thigh pockets	6	3	2	1	5	0	1									
23	New suit fits poorly	6	3	2	1	2	2	1									
24	Need three weights: light, normal, winter	5	2	2	1	1	2	2									
25	Need more sizes	5	1	3	1	1	1	3									
26	New suit pocket flap catches	4	1	2	1	1	0	3									
27	New suit too short in crotch	3	1	1	1	2	0	1									
28	Wears out too easily	3	1	1	1	0	1	2									
29	Seams rip/Poor stitching, thread	1	1	0	0	1	0	0									
30	Too small for big or tall person	1	0	0	1	1	0	0									
31	New suit baggy in hip & crotch	1	0	0	1	0	0	1									

ALSS Survey Tally Sheet (FY-95-97) NAMRL

Flight Jacket																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
---------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Boots	Total	Jet	Prop	Helo	Pilot	NFO	AC
1	Need more custom sizes (widths)	109	28	48	33	55	17	36
2	Uncomfortable	58	15	20	23	34	7	17
3	Steel toes uncomfortable in extreme cold/hi-alt	54	11	15	28	36	3	16
4	Need waterproofing	53	10	17	26	28	5	20
5	Too heavy	50	15	15	20	30	5	13
6	Too stiff	48	12	21	15	24	8	16
7	Need two pairs issued	28	10	8	10	19	4	5
8	Lighter weight boot needed	25	11	5	9	12	6	7
9	Better arch support	19	7	3	9	9	4	4
10	Need softer soles	16	1	8	7	8	1	7
11	Leather strap at base of steel toe uncomfortable	16	4	3	9	11	1	4
12	Need lace flap	12	3	3	6	7	3	2
13	Size not compatible with anti-exp	11	3	5	3	7	1	3
14	Side rips out easily	11	5	2	4	4	3	4
15	Size imprint wears off	9	2	4	3	5	1	3
16	Air vents needed	9	2	4	3	4	1	4
17	Need lining	6	0	1	5	4	4	1
18	Poor supply	6	1	2	3	4	0	2
19	Need winter version	5	3	2	0	4	0	1
20	Need better soles (insert)	4	2	1	1	2	2	0
21	Need better traction	3	1	0	2	2	0	1
22	Sole too wide-interfere with pedals	3	1	1	1	3	0	0
23	Too stiff in ankle/poor rudder pedal "feel"	3	1	1	1	2	0	1
24	Speed laces needed	3	0	2	1	1	1	1
25	Need desert style	2	1	0	1	2	0	0
26	Poor construction/quality	2	0	0	2	0	0	2
27	Scratch too easily	2	0	0	2	1	0	1
28	Need toe joint (for extended kneeling)	2	0	0	2	2	0	0
29	Laces need to be longer	2	0	1	1	2	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Gloves	Total	Jet	Prop	Helo	Pilot	NFO	AC
1	Poor fit in fingers	83	15	31	37	34	5	44
2	Poor dexterity	55	34	9	12	31	13	11
3	Seams fall apart too easily	54	10	16	28	16	3	35
4	Separate gloves needed for preflight	26	11	3	12	11	8	7
5	Gloves too thick for sense of touch	25	4	13	8	7	2	16
6	Fingers tear too easily	24	7	5	12	12	1	11
7	Poor fit in fingers	23	6	8	9	12	0	11
8	Poor supply	22	5	7	10	12	3	7
9	Need longer fingers	21	2	10	9	11	2	8
10	Winter version needed	21	11	6	4	7	7	7
11	Heavy duty gloves needed	21	2	9	10	8	3	10
12	Gloves get hard after getting wet	18	8	6	4	5	5	8
13	Tank glove replacement inadequate	18	5	6	7	7	5	6
14	Fingertips interfere with fittings (parachute, harness, etc)	18	5	2	11	12	2	4
15	More sizes needed	16	2	5	9	9	0	7
16	Poor durability	11	3	4	4	8	0	3
17	Difficult to use switches	11	4	4	3	8	1	2
18	Gloves too wide for finger length	8	0	4	4	2	1	5
19	More flexibility needed	6	1	2	3	6	0	0
20	Prefer British leather gloves	6	2	2	2	5	0	1
21	Seamless fingertips needed	1	1	0	0	1	0	0
22	Need white gloves for signaling	1	0	0	1	1	0	0
23	Prefer British leather gloves	1	1	0	0	0	1	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Torso Harness	Total	Jet	Prop	Helo	Pilot	NFO	AC
	Comment							
1	Difficult to adjust	38	25	11	2	21	11	6
2	Interferes with preflight	33	25	5	3	19	10	5
3	Need velcro thigh straps	17	10	5	2	8	3	6
4	New release mechanism for quick ejector needed	14	14	0	0	12	1	1
5	Added snaps to hold O2 mask	10	8	1	1	7	2	1
6	Restricts movement	10	7	2	1	5	3	2
7	Very uncomfortable	9	6	2	1	4	2	3
8	Poor sizing/fit	4	3	1	0	4	0	0
9	Difficult to put on	4	3	0	1	4	0	0
10	Not compatible with anti-exposure suit	2	1	1	0	2	0	0
11	Too bulky	2	2	0	0	1	1	0
12	Switch to USAF model	2	2	0	0	2	0	0
13	Longer chest strap needed	1	1	0	0	1	0	0
14	Poor availability	1	1	0	0	1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Integrated Torso Harness										Pilot	NFO	AC
	Comment	Total	Jet	Prop	Helo								
1	Difficult to put on/off	16	10	3	3			11	3	2			
2	Velcro comes undone	8	7	1	0			4	4	0			
3	Still need SV-2 for survival gear	8	4	4	0			4	4	0			
4	Excess hanging straps	7	7	0	0			6	1	0			
5	Leg straps too wide	6	4	2	0			5	0	1			
6	Not enough room for add-ons	6	5	1	0			4	2	0			
7	Poor fit	3	2	0	1			2	1	0			
8	Too bulky	3	3	0	0			2	1	0			
9	Switch to USAF type	2	0	0	2			0	0	2			
10	Custom fit needed	2	2	0	0			2	0	0			
11	Zipper pops out	2	2	0	0			2	0	0			
12	Need adapter for anti-exposure suit	2	2	0	0			2	0	0			
13	Modify harness for OBOGS	1	1	0	0			1	0	0			

#	SV-2	Comment	Total	Jet	Prop	Helo	Pilot	NFO	AC
1		Too heavy	427	75	79	273	227	28	122
2		Poor fit	165	23	56	86	83	14	64
3		Bulky	132	6	8	118	98	3	31
4		Interferes with preflight	112	5	10	97	74	4	34
5		Poor equipment position	78	6	13	59	24	8	46
6		HEEDS bottle interferes with movement	76	30	21	25	45	10	21
7		Doesn't fit over winter jacket	58	5	10	43	42	0	16
8		Flashlight too cumbersome	35	0	3	32	27	0	8
9		Neck lobe straps interfere with parachute risers	20	0	10	10	10	4	6
10		More sizes needed	20	0	6	14	12	3	5
11		Incompatible with chest armor	19	1	8	10	10	5	4
12		Need SV-2 fitted with expansion flap (anti-exposure suit, suit)	17	3	3	11	15	0	2
13		Doesn't fit over anti-exposure suit	16	5	4	7	6	2	8
14		Want mesh jacket	15	1	3	11	10	0	5
15		Too much non-useful gear	15	3	5	7	6	3	6
16		Poor supply	13	1	0	12	10	0	3
17		Air Force version better	12	6	2	4	7	4	1
18		Too hot	11	0	0	11	9	0	2
19		HEEDS needs to be shorter	11	5	0	6	10	1	0
20		Need more room for pistol and ammo	10	8	0	2	8	2	0
21		Remove elastic on back for better fit	10	2	4	4	10	0	0
22		Difficult to operate zippers	10	4	2	4	7	0	3
23		Army vest better	9	4	4	1	4	0	5
24		Not enough space for flares	9	1	2	6	7	0	2
25		Integrate life raft	7	5	2	0	5	1	1
26		Rides over release on gunner's belt	7	3	2	2	6	1	0
27		OBOGS bracket shifts pocket	7	4	0	3	5	1	1
28		Tangles in perforated safety/seat belts	6	3	1	2	3	1	2
29		Lobes come loose under G-stress	6	0	5	1	0	1	5
30		Poor quality	5	0	0	5	4	0	1
31		Need more water use in-flight	5	0	1	4	3	0	2
32		Modified for OBOGS difficult to zip/unsat	4	0	0	4	4	0	0
33		Difficult to adjust leg straps	4	0	2	2	1	0	3
34		Lobes interfere with koch release	4	0	0	4	3	0	1
35		Chest strap too long/need more Velcro	4	0	0	4	4	0	0
36		Velcro ineffective (collar lobes)	4	0	2	2	0	2	2
37		Zipper stick	2	1	0	1	1	1	0
38		Straps can hang up on egress	2	0	2	0	0	2	0
39		Need climate-specific supplies	1	1	0	0	1	0	0
40		Integrate HEEDS bottle	1	1	0	0	0	1	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

Anti-G Suit																	
#	Comment	Total	Jet	Prop	Helo	Pilot	NFO	AC									
1	Need full body suit	28	26	2	0	20	8	0									
2	Need lower back support	13	12	0	1	8	5	0									
3	Need additional for anti-exposure suit	13	13	0	0	10	2	1									
4	Might interfere with ejection	6	6	0	0	5	1	0									
5	Poor stitching/bladder leaks	5	5	0	0	4	1	0									
6	No quick adjustment feature	5	5	0	0	5	0	0									
7	Material pills	4	4	0	0	4	0	0									
8	Difficult to put on	4	4	0	0	2	2	0									
9	Not compatible with anti-exposure suit	3	3	0	0	3	0	0									
10	Incorporate leg restraints into suit	3	3	0	0	3	0	0									
11	Need quicker inflate	3	3	0	0	2	1	0									
12	Switch to USAF model	3	3	0	0	3	0	0									
13	Poor fit	2	1	0	1	1	1	0									
14	Need more sizes	2	2	0	0	2	0	0									
15	Zippers go bad	2	2	0	0	1	1	0									
16	Navy G-suit better than USAF	2	2	0	0	2	0	0									
17	Left pocket can catch on power switch	2	2	0	0	2	0	0									
18	Want/Need "Combat Edge System"	2	2	0	0	2	0	0									
19	Bottom pocket too small	1	1	0	0	1	0	0									



ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Oxygen Mask	Total	Jet	Prop	Helo	Pilot	NFO	AC
1	Poor fit	125	90	35	0	85	32	8
2	Poor quality	42	9	33	0	23	7	12
3	Snap attachment to harness needed	39	24	15	0	26	13	0
4	Better placement for bayonet fittings needed	25	3	22	0	14	2	9
5	Poor comm/O2 integration	22	14	8	0	11	7	4
6	Incompatible with helmet	20	14	6	0	13	6	1
7	Not compatible with glasses	19	18	1	0	13	4	2
8	Smoke mask poor fit	16	13	3	0	11	3	2
9	Incompatible with headset	14	8	5	1	11	2	1
10	Poor fit - quick don	12	6	6	0	7	3	2
11	More sizes needed	11	7	2	2	11	0	0
12	Need quick-don capability	10	3	7	0	4	4	2
13	Seal leaks during G's	10	5	5	0	7	3	0
14	Straps need constant adjustment	10	7	3	0	6	4	0
15	Custom fit required	10	5	5	0	4	4	2
16	Quick don frame catches on switches	10	6	4	0	7	0	3
17	Restricts movements	8	4	4	0	6	0	2
18	OBOGS lower hose too long	7	7	0	0	7	0	0
19	Longer hose for longer seat height	7	6	1	0	5	2	0
20	Use USAF	5	5	0	0	4	1	0
21	Hose too stiff (bulky)	5	3	2	0	3	2	0
22	Comm cord interferes with koch fittings	4	4	0	0	4	0	0
23	Incompatible with helo helmet	3	3	0	0	3	0	0
24	Difficult to valsava	3	1	1	1	3	0	0
25	Sweat collects and shorts mike	3	1	2	0	2	1	0
26	Uncomfortable	2	2	0	0	2	0	0
27	Restricts visibility (down)	1	0	1	0	1	0	0
28	Too heavy/bulky	1	0	1	0	1	0	0
29	Fog up	1	0	1	0	0	0	1
30	No headphones in mask (P-3)	1	1	0	0	1	0	0
31	Softer material or padding for sizing	1	1	0	0	1	0	0

#	Helmet		Total	Jet	Prop	Helo	Pilot	NFO	AC
	Comment								
1	Standardize helmets	250	58	93	99	142	36	72	
2	Chin strap uncomfortable	127	15	34	78	77	6	44	
3	Need eye protection with NVG	104	8	7	89	69	4	31	
4	Dual visors not compatible with oxygen mask	85	9	11	65	67	2	16	
5	New helmet HAS wire easily broken	71	13	25	33	49	10	12	
6	Make helmet warmer	58	12	18	28	42	1	15	
7	Need to discard NVG's to eject	52	5	7	40	34	3	15	
8	ICS communications difficult	49	12	11	26	31	5	13	
9	Need laser protection	45	15	9	21	29	9	7	
10	Not compatible with AR-5 gas mask	40	14	12	14	24	12	4	
11	UV visor needs better visibility (wider field of vision)	33	8	10	15	25	4	4	
12	Need USAF style	32	9	11	12	14	3	15	
13	Poor hearing protection	31	5	2	24	23	2	6	
14	Too heavy/bulky	26	4	12	10	13	2	11	
15	Hot spots	24	5	10	9	15	2	7	
16	Difficult to adjust in flight	23	6	4	13	22	1	0	
17	Poor molding	23	6	1	16	19	2	2	
18	Need custom fit (for all helmets)	22	2	0	20	14	2	6	
19	New helo helmet needs visor cover/change system	20	4	7	9	10	5	5	
20	Poor availability (supply, new helmet)	19	3	3	13	10	1	8	
21	New helmet not compatible with NVG	11	2	1	8	10	0	1	
22	New helmet poor fit	10	6	2	2	7	1	2	
23	Need better fitting ear cups	9	1	0	8	13	3	6	
24	Poor visibility with helmet	9	1	6	2	6	2	1	
25	Visors easily scratched	8	0	0	8	5	0	3	
26	Visor lifts off in wind stream	8	1	4	3	2	0	6	
27	Need tighter fit	8	3	2	3	4	2	2	
28	Uncomfortable	8	2	6	0	4	2	2	
29	Need more sizes	7	2	5	0	5	2	0	
30	Liner slips on new helmet	6	1	1	4	5	1	0	
31	NVG's shift under G-loads	6	0	2	4	4	0	2	
32	Difficult to preflight while wearing	5	0	1	4	5	0	0	
33	Need air-cooled helmet	5	0	2	3	4	1	0	
34	Pads fall out	3	2	0	1	3	0	0	
35	One prong pigtail system needed	2	0	0	2	2	0	0	
36	Poor construction	2	1	0	1	2	0	0	
37	New helo helmet too many parts (FOD)	2	1	1	0	2	0	0	
38	Cobra helmet attachments should run through one quick dis	1	0	0	1	1	0	0	
39	Visor should be UV protected	1	0	0	1	1	0	0	
40	More sizes needed (new helmet)	1	0	0	1	0	0	1	

ALSS Survey Tally Sheet (FY-95-97) NAMIRL

#	Anti-Exposure Suit																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</
---	--------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Anti-Exposure Liner	Total	Jet	Prop	Helo	Pilot	NFO	AC
1	Uncomfortable/bulky	355	0	1	0	0	0	1
2	Need longer sizes	73	27	7	39	49	11	13
3	Restricts movement	37	20	2	15	26	4	7
4	Size like flight suit	12	7	0	5	8	3	1
5	Does not fit with other gear	10	3	3	4	8	1	1
6	Tight	8	5	2	1	7	1	0
7	Do not like short liner	6	4	0	2	6	0	0
8	Go back to green mesh	4	0	2	2	2	0	2
9	Needs to be one piece	4	3	0	1	3	1	0
10	Need larger wrists	3	1	0	2	3	0	0
11	Use wet suit	2	1	0	1	2	0	0
12	Longer zipper needed to urinate easily	1	1	0	0	1	0	0
13	Poor supply	1	1	0	0	1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMIRL

#	Females	Total	Jet	Prop	Helo	Pilot	NFO	AC
	Comment							
1	Flight suit not made for female measurements	20	7	6	7	11	5	4
2	Glove fingers are too long	14	0	7	7	9	4	1
3	More boot sizes needed	14	5	3	6	8	3	3
4	Flight suit requires disrobe for urination	14	2	4	8	11	1	2
5	Helmet poor fit/hot spots	11	1	6	4	8	1	2
6	Poor helmet molding	11	4	4	3	4	3	4
7	Flight suit too long in the crotch	9	2	4	3	5	1	3
8	More glove sizes needed	8	4	4	0	5	3	0
9	Boots are too big	8	6	2	0	5	3	0
10	SV-2 is bulky	7	1	2	4	6	1	0
11	Oxygen mask poor fit/need quick don	7	3	2	2	2	3	2
12	SV-2 is too big/poor fit	6	1	4	1	4	2	0
13	Anti-exposure suit liner fits poorly	5	1	3	1	3	2	0
14	Glove fingers rip open	5	2	1	2	1	3	1
15	Anti-exposure suit is difficult to don	5	1	3	1	4	1	0
16	Helmet hearing protection insufficient	5	0	2	3	4	1	0
17	SV-2 Heads bottle a cockpit hazard	5	1	2	2	2	2	1
18	Anti exposure suit liner shrinks when washed	4	1	3	0	3	0	1
19	O2 mask not easily compatible w glasses	4	2	2	0	2	1	1
20	Anti-exposure suit too bulky	3	1	1	1	3	0	0
21	Smaller size boots not readily available	3	0	1	2	2	1	0
22	Oxygen mask is a poor fit	3	0	1	2	3	0	0
23	Extra small sizes needed for jacket	2	0	0	2	2	0	0
24	Anti-exposure suit shoulder zipper is uncomfortable	2	0	1	1	2	0	0
25	Exposure fit neck fittings are uncomfortable	2	0	1	1	1	1	0
26	Flight jacket needs more shoulder room	2	1	0	1	1	0	1
27	Flight jacket too long	2	0	0	2	2	0	0
28	Need anti-exposure suit with diagonal zipper	2	0	2	0	0	2	0
29	Helmet ear pads press too hard	2	1	0	1	1	0	1
30	Poor pocket placement on new suit	2	1	1	0	1	1	0
31	Torso harness doesn't fit	1	0	0	1	1	0	0
32	Glove fingers slick when wet	1	1	0	0	0	1	0
33	Anti-exposure suit is too big/egress difficult	1	0	0	1	1	0	0
34	O2 mask ICS hookup w helmet difficult	1	0	0	1	1	0	0
35	Oxygen snap fittings awkward	1	0	0	1	1	0	0
36	Anti-G suit fits poorly	1	0	0	1	1	0	0

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 22 Dec 99		3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) Summary				5. FUNDING NUMBERS NAWC-AD & PMA-202 work unit 9307 B994	
6. AUTHOR(S) A.H Bransdorfer and K.R. Johnson					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Aerospace Medical Research Laboratory 51 Hovey Road Pensacola, FL 32508-1046				8. PERFORMING ORGANIZATION REPORT NUMBER NAMRL Technical Memorandum 99-01	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Air Warfare Center-Aircraft Division (NAWC-AD) Bldg 439, Suite F 47110 Liljencrantz Road, Unit 7 Patuxent River, MD 20670-1545				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  Aviation life support systems (ALSS) equipment is a critical and essential component for mission success in naval aviation. Anecdotal comments by naval aircrews have indicated that ALSS equipment is perceived as ill-fitting and substandard. Additionally, many aircrews in naval aviation are not satisfied with current urine collection devices (UCDs). The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) survey was completed by 2,055 U.S. Navy and Marine Corps aircrew. The sample population included 85 women and 1,970 men. According to the survey results, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit. The overall performance of current ALSS was rated slightly above the median with the exception of the anti-exposure suit (rated below the median). Aircrews identified the flight suit as the number-one priority with respect to safety, thermal protection, and comfort. The helmet was identified as the number-one priority item with respect to survivability. The majority of the sampled aircrew has required the use of urine collection devices (UCDs) during flight. These aircrews selected the piddle pack and relief tube as moderately acceptable solutions for urination during flight.					
14. SUBJECT TERMS Aviation equipment      performance      aircrew      survival				15. NUMBER OF PAGES 23	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT SAR		